

Training the Next Generation of Environmental Professionals: Problems at the Academy

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Abstract

This essay examines some of the implications of the new international era to the training of environmental professionals, including water quality specialists. As human communities are brought into closer contact through global business networks, travel and advanced communications, and as environmental protection in developed countries reaches an asymptote, the need for environmental professionals will be most intense in the service of the developing world. It is not clear that our present methods for training these people, based on the paradigms prevailing in American research universities, are adequate. More attention needs to be given to the training of environmental professionals who are able to communicate with the disadvantaged people of the world and to help solve their problems. This would appear to be in conflict with the training of professionals with increasing depth and specialization. A resolution of this dilemma is possible but it will require research universities to reexamine their measures of merit and their reward systems.

Much has been written recently on the subject of global change, and indeed, it is clear that change is occurring rapidly in contemporary human society. Among the most significant changes are the development of new communications and transportation modes and the internationalization of business. These have made it possible for people to speak to each other immediately across thousands of miles and to visit each other on a day's notice. Industry is extending its manufacturing and marketing enterprises world wide, and it is clear that human civilization will never be as provincial as it once was. Yet, in the face of this amalgamation, empires and individual countries are being dissolved or fragmented by powerful aspirations of people for individual freedoms, ethnic identity, and national independence.

These trends appear to fly in the face of each other, but they may be compatible. There may yet evolve some way in which we can have individual identity and national independence while being linked by multinational financial institutions, communication mechanisms and by multinational corporations and their products. However, it is clear that some issues will require cooperation, or perhaps control, on a global scale and that some type of international organization will be necessary in order to develop and enforce guidelines to protect the common good. These issues include the prevention of nuclear proliferation, profuse

human rights violations, large scale human suffering, and environmental deterioration.

There is already evidence that the human community is beginning to appreciate the need for international protection of the commons. The UNCED conference in Rio de Janeiro signified that environmental regulation and protection on an international basis may become a reality in the 21st century. This will probably occur under the auspices of multinational consortia such as the United Nations, but other mechanisms are also apparent. These include the leveraging of international financial institutions such as the World Bank and the International Monetary Fund, and the efforts of expanding global businesses. While a truly global environmental protection agency with enough strength to enforce its mandates and standards may not be a reality within this century, some sort of standard-setting authority may emerge sooner than we think. How many of us anticipated the manner in which the countries of the world united within the UN peace-keeping forces in the Gulf War in Somalia? Similar joint activities will become more and more common in the future, I feel, and the UN will eventually take on a stronger leadership role in environmental protection. In doing so, the UN environmental agencies must rise above the petty politics that have characterized their past and mobilize the international community to address the most serious environmental problems. The developed nations must play a stronger and more enlightened role in the UN, and they must provide the funding for environmental protection in the developing world, at least initially. But more important than the money is the spread of information that will convince the emerging world governments, and more importantly their people, that environmental stewardship and sustainable development are in their best interests. As environmental literacy expands, we will see all of the world's population demand clean water, clean air, and preservation of natural beauty in the same way as we see these demands in developed countries.

There is also increasing evidence that the environmental protection paradigms of the next century will be different from those we have used in the U.S. for the past twenty years. It appears that in the 21st century, governments, business and industry will increasingly use new mechanisms to define their relationships and to limit damage to the environment. The command and control strategy that has prevailed until now will still be important, but this strategy has psychological and practical disadvantages that have limited its effectiveness. In retrospect, it is no surprise that industry, largely

managed by people with entrepreneurial philosophies, fought the EPA and state regulators so hard at the outset of the environmental protection movement. Now, it is becoming clearer that the command and control strategy is not sufficient. While it will always remain an important component of environmental stewardship, command and control alone will never inspire industry to make the fundamental changes in processes and in procedures that will minimize, or in some cases, eliminate pollution. The new paradigm that is emerging is symbolized by the key words and phrases that are becoming a part of the environmental vocabulary: "waste minimization," "life-cycle analysis," "self regulation," "economic incentives," and the most of all, "sustainable development." But beyond the jargon, there really is a new paradigm emerging, perhaps best symbolized by the report of Schmidheiny group: the Business Council for Sustainable Development, a group of CEO's and board chairmen from 48 world corporations. To quote some excerpts from the Declaration of the Council which was published just prior to the UNCED conference in RIO:

[Sustainable development] recognizes that economic growth and environmental protection are inextricably linked, and that the quality of present and future life rests on meeting basic human needs without destroying the environment on which all life depends.

Progress toward sustainable development makes good business sense because it can create competitive advantages and new opportunities. But it requires far-reaching shifts in corporate attitudes and new ways of doing business.

This process will require substantial efforts in education and training, to increase awareness and encourage changes in life-styles toward more sustainable forms of consumption. (Schmidheiny, 1992)

The Schmidheiny report asserts that in the years ahead we will see a combination of command and control, self regulation and a very large number of economic instruments such as pollution taxes, tradeable permits, the removal of distorting subsidies, etc. This process will not be without its detractors and progress will not come easy, but many believe that the new paradigm of sustainable development will eventually be accepted by all world governments and will become the standard for the new, international environmental movement that will proceed into the 21st century.

What will be the effect of this new paradigm, and the internationalization of the environmental movement, on environmental programs at universities? There are several dimensions to this, paralleling the three traditional missions of the university: instruction, research and service.

Instruction. The "new" environmental movement that we have discussed will require a much larger manpower

base than we currently have available. This would appear to portend greater opportunities for environmental professionals; however, I am not sure we are necessarily training the types of professionals most needed.

In this country, the need for many types of environmental professional shows no evidence of abating. However, as the manufacturing industries in the U.S. and other developed countries carry out their plans to minimize waste through manufacturing changes and recycle; as we asymptotically approach a state in which developed nations generate less and less unrecyclable wastes; as the emissions of toxics are essentially eliminated by product substitutions, process modifications and control strategies; and as we regulate to the lowest practical levels, we will need different types of professionals than we have needed over the past thirty years. Of course, there will always be room for improvement, replacement and expansion, but increasingly environmental protection in the developed world will be characterized by sustenance of an established protection system, rather than development of new systems. The "action" will shift to serving developing countries, a process that has already started with the remarkable amount of environmental remediation that is occurring in the former Soviet Union and eastern Europe, and in the rapid expansion of international consulting firms.

As this shift to the international scene continues, how should environmental scientists and engineers be trained differently than we now train them? First, it is clear that they will have to have additional language skills, something that has steadily been de-emphasized in graduate science programs over the last three decades. Second, I believe that environmental engineers in particular, will have to combine some of the skills of traditional sanitary engineers and chemical engineers. Third, engineers and scientists will have to be able to work in teams to address multidimensional problems that have more than a singular purpose. More likely, they will staff consulting firms that have the capability to design and optimize complex "life cycle" manufacturing and service systems so that the mistakes of the "developed" world will not be repeated. Increasingly, the handling of wastes will have to be integrated with recycling programs, conservation of energy, water and other natural resources, and waste minimization, while at the same time promoting a healthy economy of the host country. It is not clear that universities are configured to offer this type of training, partly because we now link the training of environmental professionals so closely to another important activity at universities: research.

Research vs Service. Most environmental scientists and engineers are trained in graduate programs where research is an essential activity of the faculty. This research function is and will continue to be vital to environmental protection, but as the international movement continues I believe we will increasingly see a conflict between teaching

and research, and that more credit must be given for what many now call "service." I do not mean to say that environmental research is not needed. In fact, I believe that environmental research must be given a higher priority in our nation and in the developed world. However, it is not clear that we are spending our limited research dollars wisely:

Environmental research is becoming marvelously sophisticated. As an editor, I am impressed with the speed with which the science is moving forward, the tools becoming more powerful, and the work more elegant. By and large this work needs to be supported at a much higher level than at the present time, but no matter how much money is available, it will be necessary to prioritize environmental research funding. Unfortunately, there is no coordination of environmental research in this country and I am not sure that the situation is much better in other developed countries. Moreover, it appears that the environmental, scientific, and engineering communities do not even contemplate this issue very much. My impression is that when environmental scientists are asked to think about long-term research needs, they often resort to a list of what are really *short-term* goals. All of us need to be asking on a more or less continuous basis: what really are the long-term goals for our field, i.e. those with which we will be struggling for the next half century and beyond? What are the really important questions that need to be answered, questions so "strategic" — to use a word that many are using nowadays — that we must answer them in order to fill out the fundamental knowledge base of the field?

In other areas of science, these long-term goals seem to be more apparent. In nuclear physics it is to derive and verify a unifying theory of forces that will explain all of the particles that seem to have been discovered or postulated in the past few decades. And, experimental physicists seem destined to build bigger and bigger machines to test these theories. In the life sciences, there is the human genome project and all that it signifies: the molecular basis of learning, disease, immunity, and several other related areas. In astronomy, the common purpose seems to be to verify or refute the theories of the beginning of the universe as we know it.

What are the important research questions in the area of environmental science and technology? Unfortunately, it is not clear that the leadership of the country is seriously dealing with this issue. The evidence suggests that environmental research in the U.S. is fragmented, duplicative, poorly coordinated, and misplaced (Carnegie Commission, 1992). The present interest in a National Institute for the Environment symbolizes the frustration of the research community in this situation. Hopefully, it, or something equivalent will become a reality in the near future, but we in research universities must not wait for NIE. Those of us who manage (and I use the term very loosely) university research departments must continually ask: what are the critical

environmental research areas we should emphasize in our institutions? In which areas should we be hiring new faculty? How can we elicit the cooperation of our colleagues in the basic sciences and in other peripheral fields? Will our choices of research subjects be the same as in the past? Don't you fear with me that we are training more and more people who look too much like ourselves, or in some cases the people who preceded us, rather than the kind of people needed for the future?

Like many of you who read this essay, I want to be involved in this cutting edge research and I want to be associated with colleagues who are also doing this type of work. The problem is that, while we are developing more and more sophisticated research programs in our universities, the developing world's needs may be ignored. No matter what we choose as the critical research areas of the future, we will find that much of it will be of little interest to the developing world. The research and service that will be needed there is not fantastically sophisticated and does not yield the type of publications that are respected by our peers. Indeed, publications are not the "product" that is appropriate to judge the value of teaching, research and service by a university team in a developing country. More important might be materials to communicate ideas on conservation or environmental protection to the local population or government, the development and transfer of appropriate technologies, or the development of new infrastructure to support sustainable development and environmental protection. Today, these credits do little for the resume of a professor who seeks tenure or promotion at a major university. Indeed, many senior professors advise young professors not to become involved in international work until they get tenure: it is simply too dangerous professionally. How does this attitude speak to the mission of a university? Do we need a new measure of merit in universities that is compatible with the new world paradigm?

The 21st century will surely present new challenges to the university. It must address these challenges seriously and be prepared to change. Let us hope that is possible.

Reference

Schmidheiny, S. (Chairman). 1992. *Changing Course: A Global Business Perspective on Development and the Environment*, Executive Summary (p. 7-9). Cambridge, MA: MIT Press.

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